INTERACTIVE SYSTEM AND METHOD FOR CREATING AND EDITING A KNOWLEDGE BASE FOR USE AS A COMPUTERIZED AID TO THE COGNITIVE PROCESS OF DIAGNOSIS

FIELD OF INVENTION

This invention relates to the field of computerized data bases and, more particularly, to the creation of accessible knowledge bases which contain both pictorial images and textual information. Moreover, the invention provides an interactive system and method to create, edit and utilize such a knowledge base that finds particular application in medical diagnosis, and especially pathology and radiology diagnosis.

BACKGROUND OF THE INVENTION

Electronic information storage systems having data bases which can be accessed by computer are well known. Some examples of accessible data bases are the Lexis legal research system, a data base containing legal information, and the Dialog information retrieval system, which provides access to numerous scientific and business data bases. These and several other data bases have succeeded in offering the user a vast amount of textual information which is rapidly accessible and relatively inexpensive to retrieve. However, the ability to search electronically for desirable information in these data bases often requires extensive training and skill.

With some notably few exceptions, such as the experimental patent search and retrieval system of the United States Patent and Trademark Office, most data bases do not store and thus are unable to display pictorial or other photographic/visual information. One of the reasons for this is that such image information generally requires a great deal of computer memory to store it. Although computer memory has been a decreasing cost in computer systems recently, it is still an important factor in system design and application and the amount of storage required for images is very large. Also, as a consequence of the large amount of memory space required to store images, the time required to access, process and display image information can be lengthy, so lengthy as to be unacceptable.

In addition to their failure to provide pictorial image display, most, if not all data bases that are available commercially provide limited data access tools for the user to retrieve information. This has influenced the use of these data bases because there has been a general inability to assure internal consistency of the information represented by that data base. For example, consistency of data is extremely important for applications wherein that data represents observations by a human author in a subject under investigation. Since such observations are inherently subjective to some degree—the characterization of what one individual observes will not necessarily be the same as the characterizations observed by another, and what one perceives today may differ from his perceptions tomorrow—it is important that the author of the data base have the ability to verify his observations and conclusions over a period of time, and to correct or modify those observations and conclusions for the sake of consistency. Consequently, the users of such data bases in scientific disciplines may not have sufficient confidence in the reliability of the data therein or the dependability of observations, conclusions, characterizations or deductions that may be included in the data base.

A useful field of scientific endeavor in which a text and pictorial data base finds ready application is medical diagnosis. A physician, even a specialist, often needs assistance in diagnosing a medical condition or disease based upon his clinical observations of a patient. Of course, reference to various textbooks, learned journals and other sources of expert information are quite useful and, of course, have been relied upon, but the wealth of such information now available is substantially limited by the lack of any useful resource to access it. In general, state-of-the-art electronic libraries, although proposed for medical research, have not been enthusiastically embraced by many practicing physicians. It is believed that this is due, in part, to the high cost of providing a centralized, accessible data base, in part to the need for special training in using computerized systems for data retrieval and in part to the lack of existing reliable data bases. Nevertheless, the primary reason for limited use of such electronic libraries by physicians appears to be attributed to the lack of confidence in the reliability of medical data that may be stored therein, such as diagnoses based upon clinical or histological observations, characterizations and conclusions. There is little assurance that such data is internally consistent or authenticated or even verifiable; and it is difficult to build an internally consistent data set that is created with the authenticity needed for diagnoses.

The field of pathology offers an excellent opportunity for the creation and use of a data base which would assist the pathologist in identifying characteristics associated with various diseases and in formulating his diagnosis. An internally consistent data base, that is, a knowledge base, created by an expert from case histories of numerous patients would provide a pathologist with reference materials for comparison with his present observations, thereby facilitating his diagnosis. Preferably, the knowledge base should include both textual and pictorial information derived from clinical features, histological designations and features observed from cytology specimens, thereby providing the best evidence of cases which resulted in specific diagnoses by the expert. The knowledge base should be dynamic in the sense that during its creation, newly discovered characteristics observed in patients can be added thereto and other characteristics which prove to be of lesser diagnostic importance can be deleted therefrom, thereby improving, over time, the utility of the data base in aiding a pathologist in identifying maladies and diseases. Additionally, the knowledge base should be interactive not only to permit use thereof by the pathologist but also to provide the expert who is creating the knowledge base with the retrieval tools needed to observe and compare previous observations with present analyses so as to maintain consistency of the information in the knowledge base. Since histological and cytological characterizations are, to some extent, subjective, it is useful for the expert to compare a feature which he observes in one patient or sample to the same feature which he observed in a previous patient or sample. For example, it may be important to characterize the shape of a specimen cell; and what might presently be observed as an oval or round cell might previously have been characterized as an irregular cell.

It is believed, however, that at the present time no interactive system is available with the appropriate access tools for use by an expert to craft a knowledge